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(72)Inventor : **SEKI YUKIHIRO**
KOHIYAMA TOMOHISA

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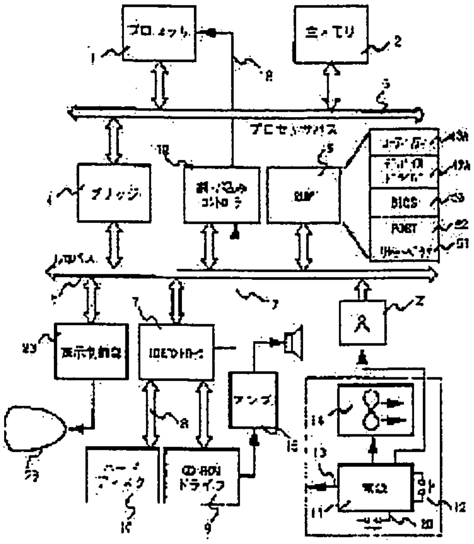
(54) **COMPACT INFORMATION PROCESSOR FOR MULTI-MEDIA**

(57)Abstract:

PROBLEM TO BE SOLVED: To switch a multi-media personal computer(PC) to a CD player function just after turning on its power supply without delay by preparing a mode of operating a compact information processor including a non-volatile memory storing self-diagnosis and initializing processing to be executed immediately after turning on the power supply by a main power supply switch as a music reproducing device.

SOLUTION: A mode switch 20 for starting the personal computer(PC) only as a CD player is prepared independently of a power supply switch 12 originally included in the PC. Whether the switch 20 is in an ON state or not is judged at the head of a POST 52, and when the switch 20 is OFF, the PC is functioned as the PC itself. When the switch 20 is ON, the PC is functioned as a CD player and only an IDE controller 7 connected to a CD-ROM drive 9, a bus bridge 4 connected to the controller 7 and an interruption controller 19 for sending an interruption signal 17 from the controller 7 to a processor 1 are diagnosed and initialized. Thereby the PC can be functioned as the CD player.



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[Patent number]

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APPLICANT	(71):	HITACHI LTD.
TITLE	(54):	SMALL MULTIMEDIA DATA PROCESSOR
FOREIGN TITLE	[54A]:	MARUCHIMEDIA KOGATA JOHO SHORI SOCHI

(54) [TITLE OF THE INVENTION] /1*

Small Multimedia Data Processor

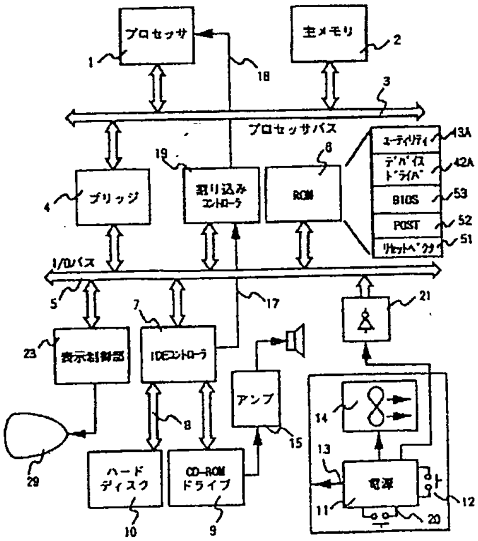
(57) [ABSTRACT]

[PROBLEM]

When a music CD is to be played on a multimedia personal computer, the listener has to wait for the operating system to boot up.

[SOLUTION]

The multimedia personal computer is equipped with a mode switch that functions as a special switch for the CD player. When the mode switch is activated, almost all of the diagnosis and initialization procedures are skipped and the device driver is started by the ROM.


プロセッサ
1
主メモリ
2
18
3
プロセッサバス
ユーティリティ
43A
デバイスドライバ
42A
BIOS
53
POST
52
リセットベクタ
51
19
6
ブリッジ
4
割り込みコントローラ
ROM
I/Oバス
5
7
17
21
23
表示制御部
IDEコントローラ
アンプ
8
15
14
13
29
ハードディスク
CD-ROMドライブ
電源
10
9
11
20
12

1... processor
2... main memory
3... processor bus
4... bridge
5... I/O bus
6... ROM
7... IDE controller
9... CD-ROM drive
10... hard disk
11... power source
19... interrupt controller
41... operating system
42A... device driver
43A... utility
51... reset vector
52... POST
53... BIOS

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*Number in the margin indicates pagination in the foreign text.

[CLAIMS] /2

[CLAIM 1]

A small multimedia data processor having a drive device to read portable media with recorded digitized music data, a main power switch to supply power to the device and non-volatile memory housing self-diagnosis and initialization processing executed immediately after power is supplied, wherein the small multimedia data processor is equipped with a mode switch functioning as a music player and a means to detect whether the state of the mode switch is true or false, wherein the non-volatile memory houses a driver processing routine to control the drive device, wherein the non-volatile memory determines the state of the mode switch in the header executed immediately after power has been supplied, skips the self-diagnosis and initialization processing of the various elements in the small multimedia data processor and then starts the driver processing routine housed in the non-volatile memory when the state of the mode switch is true, and wherein the mode makes the small multimedia data processor function as a music player.

[CLAIM 2]

A small multimedia data processor according to Claim 1, wherein the small multimedia data processor is equipped with a means for interrupting power to the circuits that are not required to play music when the mode switch for the small data processor to function as a music player has been pressed.

[CLAIM 3]

A small multimedia data processor according to Claim 1, wherein the small data processor is equipped with a means for interrupting control signals and clock signals to the circuits that are not required to play music when the mode switch for the small data processor to function as a music player has been pressed.

[CLAIM 4]

A small multimedia data processor according to Claim 1, wherein the small data processor is equipped with a means for stopping the cooling fan inside the small data processor when the mode switch for the small data processor to function as a music player has been pressed.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001] [INDUSTRIAL FIELD OF APPLICATION]

The present invention pertains to a music media drive device such as a CD-ROM drive inside a small data processor such as a personal computer equipped with multimedia functions.

[0002] [PRIOR ART]

Most personal computers (PCs) are now equipped with multimedia functions. For example, most PCs come equipped with a CD-ROM drive, audio circuits, audio sourcing, and speakers. An example of a personal computer equipped with a CD-ROM drive is shown in the drawings accompanying Unexamined Patent Application Publication [Kokai] No. 6-236280.

[0003]

The specifications for compact disks were developed by Sony Corporation and Philips N.V. of the Netherlands. The CD-ROM specifications are contained in what is commonly called the "Yellow Book", and the write-once specifications are contained in what is commonly called the "Orange Book."

[0004]

CD-ROM drives, which are designed to read CD-ROM disks, can also read music CDs. The specifications for music CDs are contained in what is commonly called the "Red Book."

[0005]

When a CD-ROM drive in a personal computer as shown in Fig. 5 is used to read a music CD, the following steps must be followed as also shown in Fig. 6.

[0006]

In Fig. 5, (1) is the processor, (2) is the main memory, (3) is the processor bus, (4) is the bridge, (5) is the I/O bus, (6) is the ROM, (7) is the IDE controller, (9) is the CD-ROM drive connected by means of an IDE interface (8), and (10) is the hard disk connected to the IDE interface (8). The hard disk (10) houses the operating system (41), the device driver (42) and a utility (43).

[0007]

When the power source (11) is turned on by pressing the power switch (12), power is supplied from the DC output (13) and the personal computer begins to operate. The processor (1) first jumps (100) to the reset vector in the ROM 6 and then begins to execute the POST routine (52).

[0008]

After the POST routine (52) has performed self-diagnosis and initialization of the various I/O ports of the personal computer (101) and has performed diagnosis and initialization of the main memory (2) (102), it shifts control to the BIOS 53. After performing the initialization process (103) required for operation, the BIOS 53 enters a boot sequence and reads the boot sector of the hard disk (10) (104). It then reads the loader section of the operating system (41) to the main memory (2) based on the program written in the boot sector (105). Then, the loader reads a kernel from the operating system (41) (106), reads the device driver (42) (107), and then finishes booting up the operating system (41).

[0009]]

The booting sequence of the operating system is disclosed in Kokai No. 6-236280 and Kokai No. 6-75754.

[0010]

If a utility (43) is part of the automatic intialization process, the utility is read and started after the operating system (41) has been loaded. It the utility is not part of the automatic initialization process, it is read and started by the user.

[0011]

Figure 7 shows an example of a graphic user interface (44) for the utility (43). The graphic user interface in this case is designed to resemble the control panel on a CD player. A mouse is used to move the cursor (45) to the play button. When a button on the mouse is clicked as the cursor is over the play button, the device begins to play the music CD.

[0012] [PROBLEMS TO BE SOLVED BY THE INVENTION] /3

It takes a long time for the various parts of the POST 52 to be initialized when the PC is started. In addition to all of the components shown in Fig. 5, it takes longer and longer each year to test the operation of the I/O ports as new types of I/O ports are introduced. Because the amount of time required to diagnosis and initialize the main memory (2) depends on the size of the memory, this process is also taking longer and longer each year as the size of the main memory (2) increases.

[0013]

The amount of time required to load the operating system (41) has also expanded with the growth in the size of the operating system (41).

[0014]

In a test, the amount of time required to load the operating system (41) and device driver (42) after pressing the power switch (12) on a typical personal computer was measured. It took 35 seconds to complete the BIOS 52 processing and one minute and ten seconds to complete the loading of the operating system (41) for a total of one minute and 45 seconds. If the initialization of a utility (43) is added, it takes over two minutes to be able to listen to a CD after pressing the power switch.

[0015]

In contrast, it takes about 1-3 seconds to start the CD player in a stereo unit or a radio cassette unit because, unlike a personal computer, these devices do not have to load an operating system (41).

[0016]

Most consumers would like to be able to begin listening to music on a CD player in much less time, and they feel inconvenienced by such a wait. Most people realize a CD player cannot be started in zero seconds, but the most they will tolerate is a few seconds.

[0017]

As more personal computers are equipped with multimedia functions, the line between personal computers and consumer electronics is becoming blurred. For this reason, the long wait is preventing more personal computers from being used as music CD players.

[0018]

In order for more personal computers to become the music CD player of choice, the amount of time required to start the CD player has to be reduced to a tolerable level.

[0019]

Also, starting the other components in a personal computer such as the CRT 29 display and the hard drive (10) in order to listen to a music CD is a waste of power. The operation of these components also detracts from listening to music because a fan (14) has to be operated to dissipate the heat generated by these components.

[0020] [MEANS OF SOLVING THE PROBLEMS]

In order to solve these problems, a personal computer should be able to function as a CD player using as little processing as possible when the power is turned on.

[0021]

In addition to the power switch (12) on current personal computers, the personal computer of the present invention is equipped with a mode switch (20) that is only used to start the music CD player. The mode switch (20) is used only to determine whether the header in the POST 52 is on. If the header is on, it indicates that the user wants to use the computer as a PC. As a result, it should shift to the normal POST 52 process.

[0022]

If the header is off, it indicates that the user wants to use the computer as a music CD player. As a result, it should shift to an additional process described in the present invention.

[0023]

In this process, only the IDE controller (7) connected to the CD-ROM drive (9), the bridge (4) connected to the IDE controller (7), and the interrupt controller (19) used to send interrupt signals (17) from the IDE controller (7) to the processor (1) are diagnosed and initialized.

[0024]

Also, the device driver (42) used to play music CDs is housed in a ROM 6 instead of on the hard drive (42). Only enough workspace to operate the device driver (42) is diagnosed and initialized in the main memory (2).

[0025]

As a result, the time required to start these components can be reduced to a few seconds.

[0026]

In order to solve the problem of excess power consumption, direct current (13) and clock signals are supplied only to the components required to play a music CD: the IDE controller (7), the bridge (4), the interrupt controller (19), the amp (16), the ROM 6, and the main memory (2). This reduces the amount of power consumed.

[0027]

The power saving means of the prior art are disclosed in Kokai No. 6-83491 and Kokai No. 6-124150.

[0028]

In order to eliminate the noise produced by the operation of the fan (14), the operation of the fan (14) can be suspended when power is supplied while the mode switch (20) is on. The suspension control can be provided by a method in which hardware is operated directly by the bit data indicated when the mode switch (20) is pressed or by a method in which the POST 52 detects whether or not the mode switch (20) is on and operates or suspends the fan (14).

[0029]

The cooling operation of the fan 14 is disclosed in Kokai No. 6-67754.

[0030]

When the CD-ROM drive (9) is operated under these conditions, there is no operating system (41) or utility (43) in effect. Because the graphic user interface (44) shown in Fig. 7 cannot be used, a display routine can be incorporated into the ROM 6, operating switches can be installed in front of the personal computer, or a remote control can be used. /4

[0031] [PREFERRED EMBODIMENTS]

The following is an explanation of the present invention with reference to the drawings. Figure 1 shows a configurational example. Figure 2 shows the operational flowchart for the ROM 6.

[0032]

In the drawing, (20) indicates the additional mode switch which also serves as an alternate power switch.

[0033]

Immediately after power is supplied using the power switch (12) or the mode switch (20), the processor (1) begins to execute the address determined by the program architecture, i.e., from the reset vector (51) at the end of the ROM 6 (100). The reset vector (51) is set to indicate the header of the POST 52.

[0034]

In the present invention, a step is added to the header of the POST 52 to check whether the mode switch (20) is on using a mode flag reading circuit (21) (201). This process has not been used on a multimedia personal computer before.

[0035]

If it determines that the mode switch (20) is off, the processor jumps to the normal POST process (210). This process is the same as the process on other multimedia personal computers. For a summary of the prior art process, see Fig. 6.

[0036]

If the mode switch (20) is on, the processor is diverted to the "light processing" that is the special characteristic of the present invention. In Fig. 2, for example, the IDE controller (7) is diagnosed and initialized (203), the interrupt controller (19) is diagnosed and initialized (204), and only 64 KB from the head address in the main memory (2) are diagnosed and initialized (205). The processor then jumps to the device driver (42) housed in the ROM 6.

[0037]

The device driver (42A) is identical to the device driver (22) housed on the hard drive (10) except that it includes sections that can be operated without using the operating system (41).

[0038]

When the initialization of the device driver (42A) is complete (206), the CD-ROM drive (9) can be used. When a CD is placed in the CD-ROM drive (9) by the user, interrupt signals are sent from the IDE controller (7) to the processor (1) (207, 208). In this preferred embodiment, the player processing routine is such that the interrupt signals are sent and the playing of the CD begins immediately after the CD has been inserted (209) because of the lack of a graphic user interface (44) for the CD-ROM drive. Music CDs can be played in this manner.

[0039]

Figure 3 shows the simplest example of a configuration for the power switch (12), the mode switch (20) and the mode flag write circuit (21). The switch element in the mode switch (20) is connected parallel to the power switch (12). The mode switch (20) being on or off is the equivalent of the personal computer as a CD player being on or off.

[0040]

The mode signal (22) can be used to control the power supply in the manner described below.

[0041]

The mode flag reading circuit (21) should be designed so that the mode signal (21) [sic] is sent to the I/O bus (5) if the address conditions in the address decoder circuit are right.

[0042]

In Fig. 1, a utility (43A) is housed in the ROM 6 with the device driver (42A) for the CD-ROM drive (9). A process is also added to the ROM 6 to initialize and set the display control circuit (23). Because the graphic user interface function of the operating system (41) cannot be used, the utility (43A) displays the graphic user interface (44) in Fig. 7 directly on the display control circuit (23).

[0043]

As a result, the user can operate the device in the same manner as a CD player.

[0044]

Figure 4 is a reduced power version of the mode signal (22) used by the mode switch (20). Power to the hard drive (10), which is not required for playing music CDs, is interrupted using a relay circuit (24A). The refresh procedure for the memory modules not required in the main memory (2) are terminated by masking the RAS signal (25) and CAS signal (26) at AND gate (27A) and AND gate (27B). This reduces the amount of power consumed.

[0045]

Additional power is conserved by shutting down the power supplied to the CRT monitor (29) or the LCD backlight. The clock signals sent to these elements are also masked. The termination of clock signals alone to integrated circuits such as CMOS circuits results in significant energy savings.

[0046]

More energy can be saved by reducing the clock frequency of the processor (1). Because, unlike other personal computers, only the CD-ROM drive (9) is being controlled, the performance of the processor (1) is not affected.

[0047]

In Fig. 4, the supply of power to the fan (16) is interrupted by a relay circuit (24B) in order to reduce the amount of noise in the music listening environment. This also results in power savings.

[0048]

In these preferred embodiments, the CD-ROM drive (9) was connected using an IDE interface (8), but a SCSI (small computer system interface) can also be used. In these preferred embodiments, the music signals from the CD-ROM drive (9) were also connected to an amp (16), but the digital signals read by the IDE interface (8) can also undergo special digital-to-analog conversion before being played.

[0049]

Because the present invention performs "light processing" to play music CDs using a direct use of power, an interface is not needed.

[0050]

In addition to CD-ROM drivers (9), the present invention can be used with other media such as minidiscs (MD).

[0051]

The ROM 6 can also be a writable flash EEPROM. The device driver (42A) and the utility (43A) can be upgraded whenever necessary.

[0052] [EFFECT OF THE INVENTION]

When the present invention is used, a multimedia personal computer can function as a CD player drawing power directly. As a result, there is no delay required to boot up the operating system and draw power. The present invention also reduces the amount of power consumed and reduces fan noise.

[BRIEF EXPLANATION OF THE DRAWINGS]

[Figure 1] A block diagram of a preferred embodiment of the present invention.

[Figure 2] A flowchart of the software processing.

[Figure 3] A circuit diagram of a configuration for the mode switch (20).

[Figure 4] A circuit diagram of a circuit configuration to reduce the amount of power consumed.

[Figure 5] A block diagram of the prior art.

[Figure 6] A flowchart of the prior art software processing.

[Figure 7] A drawing used to explain the CD operation window.

[KEY TO THE DRAWINGS]

1... processor

2... main memory

5... I/O bus

6... ROM

7... IDE controller

9... CD-ROM drive

10... hard disk

12... power switch

14... fan

19... interrupt controller

20... mode switch

21... mode flag reading circuit

22... mode signal

41... operating system

42, 42A... device drivers

43, 43A... utilities

44... graphic user interface

52... POST

53... BIOS

[Figure 1]
Key: 1... processor; 2... main memory; 3... processor bus; 4... bridge; 5... I/O bus; 6... ROM; 7... IDE controller; 9... CD-ROM drive; 10... hard disk; 11... power source; 19... interrupt controller; 41... operating system; 42A... device drivers; 43A... utilities; 51... reset vector; 52... POST; 53... BIOS.

[Figure 2]
Key: 100... jump to reset vector 51; 201... read mode flag; 203... diagnose and initialize IDE controller 7; 204... diagnose and initialize interrupt controller 19; 205... diagnose and initialize only 64 KN of main memory 2; 42A... device driver; 206... initialize device driver 42A; 207... interrupt standby; 208... insert CD?; 209... replay; 210... to normal post 52 processing.

[Figure 3]
Key: a) address decoder

[Figure 4]
Key: 2... main memory; 10... hard disk; 13... DC output; 14... fan; 22... mode signal; 25... RAS signal; 26... CAS signal.

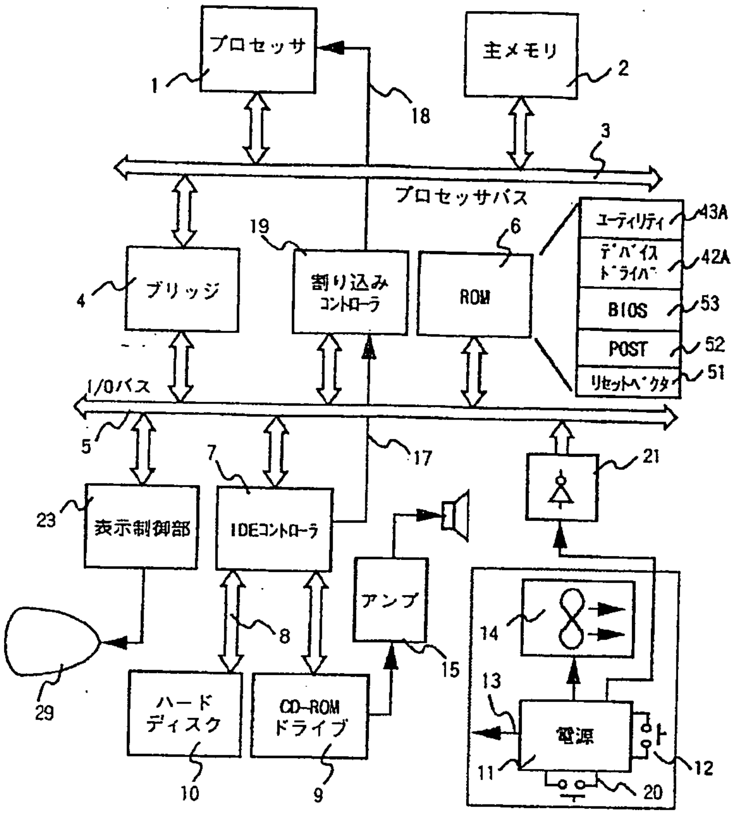
[Figure 5]
Key: 1... processor; 2... main memory; 3... processor bus; 4... bridge; 5... I/O bus; 6... ROM; 7... IDE controller; 9... CD-ROM drive; 10... hard disk; 11... power source; 16... amp; 19... interrupt controller; 41... operating system; 42... device drivers; 43... utility; 51... reset vector; 52... POST; 53... BIOS.

[Figure 6]
Key: 52... POST; 100... jump to reset vector 51; 101... diagnose and initialize I/O; 102... diagnose and initialize main memory 2; 53... BIOS; 103... initialize BIOS; 104... read boot sector on hard disk 10; 41... operating system; 105... read loader; 106... read kernel; 107... read device driver 42.

[Figure 7]
Key: a) utility

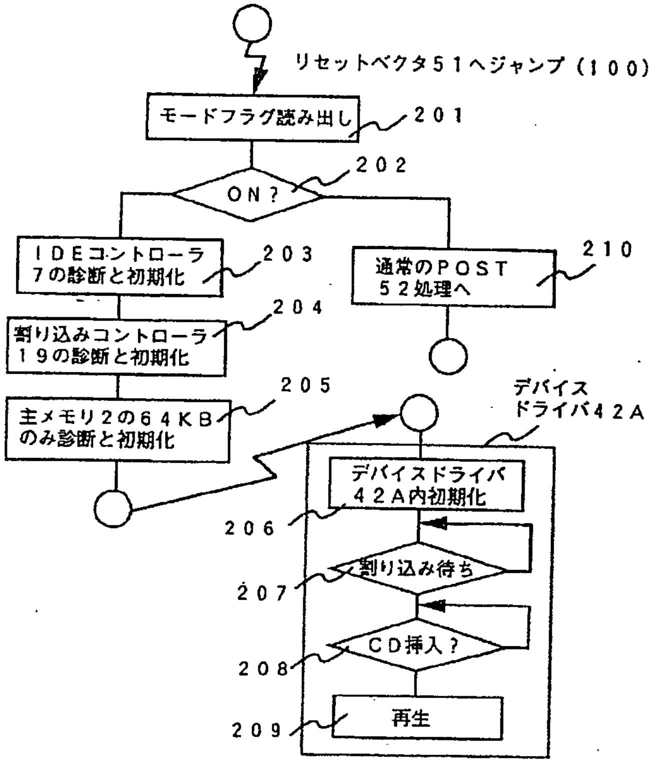
【図1】[Figure 1]

図1


プロセッサ
1
18
主メモリ
2
3
プロセッサバス
ユーティリティ
43A
デバイス
ドライバ
42A
BIOS
53
POST
52
リセットベクタ
51
19
割り込み
コントローラ
6
ROM
4
ブリッジ
I/Oバス
5
7
17
21
23
表示制御部
IDEコントローラ
アンプ
14
8
15
13
29
ハード
ディスク
CD-ROM
ドライブ
電源
12
11
20
10
9

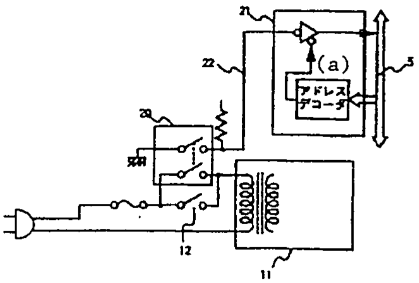
【図2】[Figure 2]

図2


リセットベクタ５１へジャンプ（１００）
モードフラグ読み出し
２０１
ＯＮ？
２０２
ＩＤＥコントローラ７の診断と初期化
２０３
割り込みコントローラ１９の診断と初期化
２０４
主メモリ２の６４ＫＢのみ診断と初期化
２０５
通常のＰＯＳＴ５２処理へ
２１０
デバイスドライバ４２Ａ
デバイスドライバ４２Ａ内初期化
２０６
割り込み待ち
２０７
ＣＤ挿入？
２０８
再生
２０９

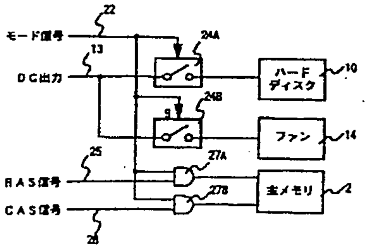
【図3】[Figure 3]

図3


21
(a)
アドレスデコーダ
5
22
20
双投
12
11

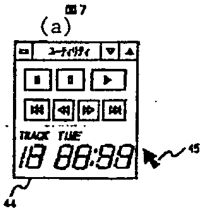
【図4】[Figure 4]

図4


22
モード信号
13
DC出力
24A
ハードディスク
10
24B
ファン
14
25
RAS信号
27A
27B
主メモリ
2
CAS信号
26

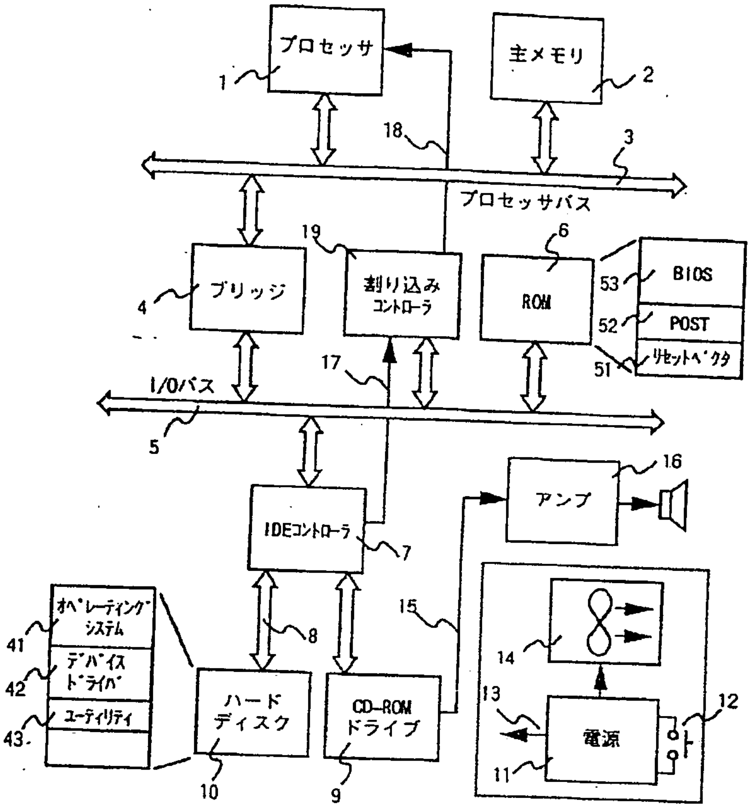
【図7】
[Figure 7]

図7


(a)
ユーティリティ
TRACK TIME
18 88:99
45
44

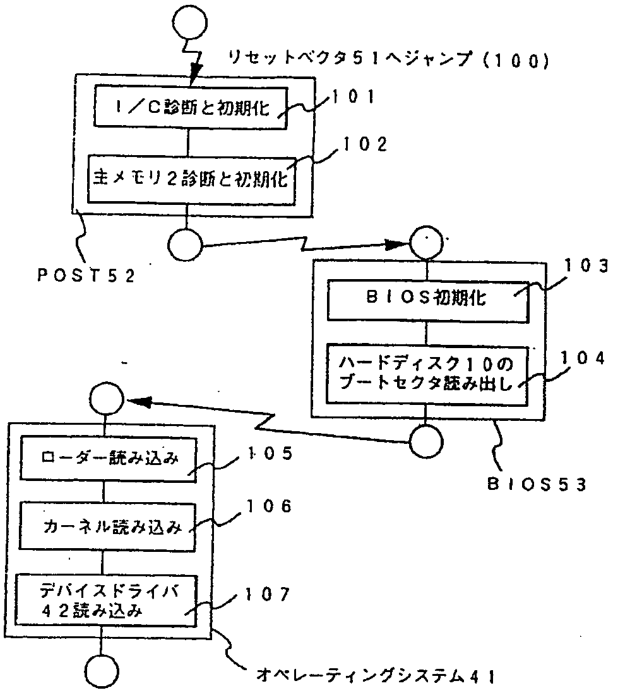
【図5】[Figure 5]

図5


プロセッサ
1
主メモリ
2
18
3
プロセッサバス
19
割り込み
コントローラ
6
ROM
BIOS
53
POST
52
リセットベクタ
51
4
ブリッジ
17
I/Oバス
5
16
アンプ
IDEコントローラ
7
15
8
オペレーティング
システム
41
デバイス
ドライバ
42
ユーティリティ
43
ハード
ディスク
10
CD-ROM
ドライブ
9
14
13
12
電源
11

【図6】 [Figure 6]

図6


リセットベクタ51へジャンプ（100）
I／C診断と初期化
101
主メモリ2診断と初期化
102
POST52
BIOS初期化
103
ハードディスク10のブートセクタ読み出し
104
BIOS53
ローダー読み込み
105
カーネル読み込み
106
デバイスドライバ42読み込み
107
オペレーティングシステム41